Name:

Level 2 Further Maths

Expanding 3 Brackets

Corbettmaths

Ensure you have: Pencil or pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Revision for this topic

www.corbettmaths.com/more/further-maths/

1. Expand and simplify fully $(x + 1)(x + 2)(x + 3)$

$$\left(x^2 + 3x + 2 \right)\left(x + 3 \right)$$

$$x^3 + 3x^2 + 2x + 3x^2 + 9x + 6$$

$$=$$

$$\underline{x^3 + 6x^2 + 11x + 6}$$

(3)

2. Expand and simplify fully $(x + 7)(x + 3)(x + 5)$

$$\left(x^2 + 10x + 21 \right)\left(x + 5 \right)$$

$$x^3 + 10x^2 + 21x + 5x^2 + 50x + 105$$

$$\underline{x^3 + 15x^2 + 71x + 105}$$

(3)

3. Expand and simplify fully $(y + 1)(y - 4)(y + 2)$

$$(y^2 - 3y - 4)(y + 2)$$

$$y^3 - 3y^2 - 4y + 2y^2 - 6y - 8$$

$$\underline{y^3 - y^2 - 10y - 8}$$

(3)

4. Expand and simplify fully $(x - 6)(x - 3)(x - 2)$

$$(x^2 - 9x + 18)(x - 2)$$

$$x^3 - 9x^2 + 18x - 2x^2 + 18x - 36$$

$$\underline{x^3 - 11x^2 + 36x - 36}$$

(3)

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5. Expand and simplify fully $(2w + 1)(2w + 5)(w + 2)$

$$(4w^2 + 12w + 5)(w + 2)$$

$$4w^3 + 12w^2 + 5w + 8w^2 + 24w + 10$$

$$\underline{4w^3 + 20w^2 + 29w + 10}$$

(3)

6. Expand and simplify fully $(3x - 1)(2x - 5)(x + 1)$

$$(6x^2 - 17x + 5)(x + 1)$$

$$6x^3 - 17x^2 + 5x + 6x^2 - 17x + 5$$

$$\underline{6x^3 - 11x^2 - 12x + 5}$$

(3)

7. Expand and simplify fully $(3 - y)(4 - y)(2y + 3)$

$$\left(12 - 7y + y^2\right)\left(2y + 3\right)$$

$$24y - 14y^2 + 2y^3 + 36 - 21y + 3y^2$$

$$\dots\dots 2y^3 - 11y^2 + 3y + 36 \dots\dots$$

(3)

8. Expand and simplify fully $(x + 4)(x + 2)^2$

$$\left(x + 4\right)\left(x^2 + 4x + 4\right)$$

$$x^3 + 4x^2 + 4x + 4x^2 + 16x + 16$$

$$\dots\dots x^3 + 8x^2 + 20x + 16 \dots\dots$$

(3)

9. Expand and simplify fully $(4y - 1)^2(y - 2)$

$$\left(16y^2 - 8y + 1\right)\left(y - 2\right)$$

$$16y^3 - 8y^2 + y - 32y^2 + 16y - 2$$

$$\underline{16y^3 - 40y^2 + 17y - 2}$$

(3)

10. Expand and simplify fully $(x + 1)^3$

$$\left(x + 1\right)\left(x + 1\right)\left(x + 1\right)$$

$$\left(x^2 + 2x + 1\right)\left(x + 1\right)$$

$$x^3 + 2x^2 + x + x^2 + 2x + 1$$

$$\underline{x^3 + 3x^2 + 3x + 1}$$

(3)

11. Expand and simplify fully $(y + 4)^3$

$$(y + 4)(y + 4)(y + 4)$$

$$(y^2 + 8y + 16)(y + 4)$$

$$y^3 + 8y^2 + 16y + 4y^2 + 32y + 64$$

$$\underline{y^3 + 12y^2 + 48y + 64}$$

(3)

12. Expand and simplify fully $(x - 3)^3$

$$(x - 3)(x - 3)(x - 3)$$

$$(x^2 - 6x + 9)(x - 3)$$

$$x^3 - 6x^2 + 9x - 3x^2 + 18x - 27$$

$$\underline{x^3 - 9x^2 + 27x - 27}$$

(3)

13.   Expand and simplify fully $(2m - 5)^3$

$$(2m - 5)(2m - 5)(2m - 5)$$

$$(4m^2 - 20m + 25)(2m - 5)$$

$$8m^3 - 40m^2 + 50m - 20m^2 + 100m - 125$$

$$8m^3 - 60m^2 + 150m - 125$$

(3)

14.   Expand and simplify fully $(10 - x)^3$

$$(10 - x)(10 - x)(10 - x)$$

$$(100 - 20x + x^2)(10 - x)$$

$$1000 - 200x + 10x^2 - 100x + 20x^2 - x^3$$

$$-x^3 + 30x^2 - 300x + 1000$$

(3)

15. Given that $(x + 3)(x - 5)(x + a) \equiv x^3 + 4x^2 - 27x - 90$
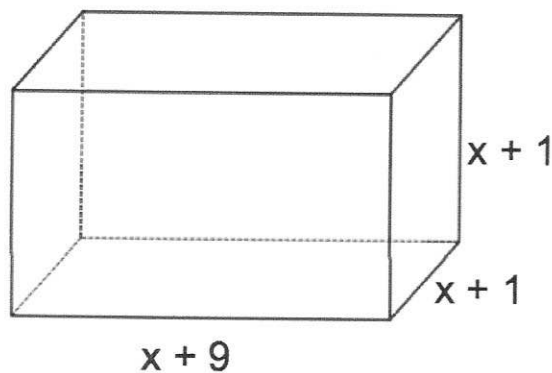
Find the value of a

$$-15a = -90$$
$$a = 6$$

6

(2)

16. Shown below is a cuboid.

$x + 1$

$x + 1$

$x + 9$

Form an expression for the volume of the cuboid.
Expand and simplify the expression.

$$(x+1)^2 (x+9)$$
$$(x^2 + 2x + 1)(x+9)$$
$$x^3 + 2x^2 + x + 9x^2 + 18x + 9$$

$$x^3 + 11x^2 + 19x + 9$$

(4)

17. Given that $(x + 3)(x + a)(x + 7) \equiv x^3 + 15x^2 + 71x + 105$

Find the value of a

$$21a = 105$$

$a = 5$

....

(2)

___

18. Given that $(ax + 1)(x - 3)(x + b) \equiv 2x^3 - 3x^2 - 8x - 3$

Find the values of a and b

$a = 2$ $b = 1$

$ax^3 = 2x^3$ $-3b = -3$

....

(4)

19. Given that $(x + a)^2(x - 2) \equiv x^3 + bx^2 + 12x - 72$

Find the values of a and b

$$\left(x^2 + 2ax + a^2\right)\left(x-2\right)$$

$$x^3 + 2ax^2 + a^2x - 2x^2 - 4ax - 2a^2$$

$$x^3 + 2ax^2 - 2x^2 + a^2x - 4ax - 2a^2$$

$$x^3 + \left(2a-2\right)x^2 + \left(a^2-4a\right)x - 2a^2$$

$$-2a^2 = -72$$
$$a^2 = 36$$
$$a = \pm 6$$

Is $a = 6$ or $a = -6$?

$$\left(a^2 - 4a\right) = 12$$

if $a = 6$
$$a^2 - 4a = 12 \checkmark$$

if $a = -6$
$$a^2 - 4a = 60 \ \times$$

$\therefore \quad a = 6$

$b = 2a - 2$

$b = 12 - 2$

$b = 10$

....
(4)

20. Given that $(ax + b)(x + 4)(x + c) \equiv 2x^3 + 19x^2 + 49x + 20$

   where a, b and c are integers.

   Find the values of a, b and c

$$a = 2$$

$$(2x + b)(x + 4)(x + c)$$

$$(2x^2 + 8x + bx + 4b)(x + c)$$

$$2x^3 + 8x^2 + bx^2 + 4bx + 2cx^2 + 8cx + bcx + 4bc$$

Constants

$$4bc = 20$$

$$bc = 5$$

x^2

$$8 + b + 2c = 19$$

$$b + 2c = 11$$

x

$$4b + 8c + bc = 49$$

$$a = 2$$
$$b = 1$$
$$c = 5$$

....

(5)

$$c = 5$$
$$b = 1$$

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